

LEARNING FROM EXPERIENCE: STUDENTS IN THE INTERNATIONAL BACCALAUREATE IN NATURAL SCIENCE PROGRAM ARE IN ECUADOR*

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With its enriched curriculum, the International Baccalaureate (IB) diploma program is a pre-university program that is offered in more than 135 countries. It is sanctioned by rigorous final exams and it prepares students “for entry to university and for an active life. The program is taught over a two-year period and enjoys the recognition and respect of the most prestigious universities in the world”¹. In Quebec, among others, the IB program in Natural Science is offered at *Cégep André-Laurendeau* in Montreal.

In order to obtain an IB diploma, in addition to passing the above-mentioned examinations, students must also meet requirements we refer to as the “CAS” of the IB, that is a group of activities encompassing Creativity (the practice of any art form, for instance), Action (physical activity) and Service (volunteering and community service). CAS activities “require that students get actively involved in real projects beyond the academic framework and that they learn from this experience”². This extracurricular component is designed to promote the development of the whole person and, by the end of their studies, students must have met the eight CAS³ learning objectives.

THE CAS LEARNING OBJECTIVES

To meet CAS objectives students will:

- 1) have become aware of their strong points and the areas where they need to improve;
- 2) have faced new challenges;
- 3) have planned and undertaken activities;
- 4) have worked in collaboration with others;
- 5) have demonstrated perseverance and commitment with regard to the activities undertaken;
- 6) have examined issues of worldwide importance;
- 7) have reflected on the ethical implications of their actions;
- 8) have developed new competencies.

* This article was written with the invaluable collaboration of Julie Roberge, coordinator of the International Baccalaureate program at *Cégep André-Laurendeau*.

¹ International Baccalaureate Organization (IBO). [<http://www.ibo.org/fr/diploma/>]

² IBO. [<http://www.ibo.org/fr/diploma/>]

³ IBO. *Creativity, Action, Service guide*. [http://store.ibo.org/product_info.php?products_id=1121] [http://occ.ibo.org/ibis/documents/dp/drq/cas/d_0_casxx_gui_0803_1_f.pdf]

Although students are generally very satisfied with the IB program, in the autumn of 2000 some students raised the issue that, in spite of its name, the program offered little that was international, other than the reflections they could express in various courses and the few trips in which they could participate during their studies.

It was immediately to the CAS that we turned then to respond to the students' legitimate criticism and to lead students to a different playing field, to have them go out and explore the vastness of the world in order to do international development work. But where to start? As luck would have it and with one thing leading to another, it is thanks to Tom Walsh, an international worker who was then working in Ecuador, that we decided to travel to this small South American country, more specifically to the little mountain village of Pulingui San Pablo where the quality of life of indigenous communities is below that of other Ecuadorian communities.

Next, we quickly had the idea to graft onto this project the Group 4 Project (G4P), a feature of the IB program by virtue of which it is obligatory for students to carry out scientific research in the field, either alone or in a group: identification of a problem, data collection and analysis. So, why not twin the G4P with its science courses (Biology, Chemistry or Physics, depending on the year) and the CAS to create an international experience that would meet several objectives?

And so, since January 2001, thanks to a random student criticism, to teachers' involvement and to the welcome from an entire community, more than 150 students from the International Baccalaureate program at *Cégep André-Laurendeau* have travelled to Ecuador during the intersession of their second year of studies to carry out a science project and to broaden their horizons.

■ PRIOR TO DEPARTURE

It takes about one year to prepare for this unique trip. In fact, as soon as students return for their second year, those in first year start to dream of their own trip and they begin to think of funding sources for trip the following year... That is when team spirit begins to build for all those who want to be part of the adventure.

At the autumn start of the school year, like their teachers, students turn their thoughts to projects that it would be possible to carry out in Ecuador.



The contacts I have with Ecuadorians, even though they are not always easy (it is not a question of language, but rather of the quality of communication channels, the Internet not always being accessible there and because Ecuadorian communication habits differ from ours), enable me to convey to the students the needs expressed by the communities that will receive them and we all (teachers, students and hosts) organize our trip. Science and Social Science teachers also join us to see how we can integrate the content of their courses into the Ecuadorian adventure.

EXAMPLES FOR 2009-2010

G4P – Epidemiological Study

To take one example, in the autumn of 2009, within the frameworks of their Biology course and of the G4P, students had the opportunity to conduct an epidemiological study on the impact of lifestyle habits (food, level of physical activity, use of tobacco, etc.) on the health of individuals. They conducted an initial study on a group of Montrealers, supervised by their Biology teacher. Subsequently, during the January 2010 trip, the study was conducted again on a population of indigenous Ecuadorians in order to compare the results from the two groups. This project, which was integrated with and evaluated in the Biology course, required students to apply the scientific concepts and data-collection techniques they had learned in their courses. For one of my colleagues, a Biology teacher, as early as the fall term, the fact that the students participate in this type of project clearly prompted him to modify both his pedagogical approach – in such a context, it can only be practical – and his worldview, since he himself was to accompany the group to Ecuador during the upcoming intersession.

CAS – Alternative Sources of Energy

In parallel, within the CAS framework and at the request of our Ecuadorian partners, in the fall the students undertook a project on alternative energy. More specifically, their goal was

to build a very simple prototype of a wind turbine and a solar water heater in order, once on site in January, to explore with the Ecuadorians the possibilities of reducing their energy costs and of improving their access to hot water and electricity. To carry out this project, students used their knowledge of physics (an electricity and magnetism course) and, even though the project was not to be formally evaluated in their courses, Physics teachers were also involved. Although experiments conducted in science courses can be somewhat “theoretical”, in the sense that they take place in laboratories on the sixth floor of the CEGEP, this was certainly not the case for this project: we had to find a way to make the wind turbine and hot water heater really work, since this equipment met a real need expressed by the group's host community.

The students, who reflected on this project with their teachers for a good part of the fall, set up shop in a garage belonging to the father of one of the students and created scale models of the wind turbine and the water heater to make sure they worked. They also had to think about the materials they would need to build this equipment, given the scarcity of such materials in Ecuador. A remarkable event this year: in addition to the two accompanying teachers, an IB graduate from *Cégep André-Laurendeau*, now an electrical engineer, was also going to go with the group to Ecuador. During the fall session, this former student met with the students on several occasions in an effort to find together the best ways of proceeding to make everything work out. He was the one who designed and directed the wind turbine and water heater projects as much in Montreal as on site in Ecuador. Students were thus able to see for themselves that a scientist's commitment to others can be maintained even after the studies are completed, as can the pleasure of giving, freely, of one's time to make a difference in remote communities.

CAS – Teaching English

In addition to these projects which rely on the competencies of students in biology or in physics, a third project begun in earlier stages was also pursued in the fall. This project, which counted for the “creativity” and “service” components of the CAS, consisted in a pedagogical involvement at the school in Pulingui Centro, where last January, participants were called on to begin activities in English as a second language. Since I teach English as a second language, this project has special meaning for me: prior to departure, I must go over with the students different pedagogical methods which will enable them to engage in teaching of English as a second language to the young – and the not-so-young – who know very little about the language of Shakespeare. Although science projects

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and those usually associated with CAS activities change every year, it is different for the teaching of English which students have been carrying out every year there for the past ten years. With experience, I am able to foresee how the teaching should play out and this helps me to better prepare students for this task which is unknown territory for them and to supervise them on site: after all, they are students and this project makes them move fairly suddenly from the other side of the class. For me, it is especially an opportunity to have students experience the reality of teachers' work and to have them see how demanding it is in terms of creativity and adaptation.

I must also teach them to become aware of the different ways of learning: as students, they are not necessarily able to take a step back and look at their own ways of learning, and some have rarely reflected on effective study or learning strategies. As they reflect on pedagogical methods to use in Ecuador, they also think about the best ways to learn. As a teacher, such reflection also leads me to review my own pedagogical methods: what to do to help them understand that this metacognition on learning will be useful to them throughout their lives?

Preparation and Impact

One aspect is important to deal with even before leaving: the perception the young people have of the work and of the overall experience they will live while away. What are their expectations, their apprehensions? It is absolutely necessary to do this discussion work in order to avoid disappointments: very often, when it comes to international work, young people start off with noble ideals and they really want to make a difference. However, once on site, they realize that their work is a just a tiny drop of water in the bucket in the totality of local community needs.

Overall, I believe that projects such as those presented so far have an impact on many of my teaching colleagues, even if their disciplines are not directly involved in the work that the students will carry out abroad. Indeed it is hard to sidestep the intensive preparation required for this kind of trip when students talk about it almost on a daily basis, when they compare their technical know-how with what they believe to be the South American reality or when they talk about the weekend spent in the garage of Geneviève's father assembling a small engine that can generate electrical power... Not to mention the amount of time some of my colleagues spend helping the students finance their trip by buying chocolate bars or by bagging customers' food at a supermarket.

ON SITE

Over the years, the projects carried out have varied considerably having been selected, at the same time, on the basis of pedagogical needs, the criteria of donors, the competency of the students, community needs as well as the amount of time students have and the materials they will find on site. Course-related activities must necessarily be part of a scientific and organized process, but when it is a question of being of service to Ecuadorian communities, projects also include some unknown aspects and some work not usually associated with their studies. Thus, depending on the year, the students have, among other projects, cleared a path that would serve to attract tourists in search of high adventure on the slopes of Mount Chimborazo (this is extremely hard work to carry out at an altitude of 3,200 metres); renovated a hacienda with available means (little electricity, shortage of materials, lack of local supervision, but plenty of this "System D" that especially enabled students to make a spirit level using a bottle of water to build level bunk beds to furnish the residence); planned and organized a garden for growing native plants that are resistant to climate and altitude; and, every year, taught English to children or young adults so that they can welcome tourists in this language.

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CAS – Alternative Sources of Energy

In January 2010, the science projects worked well... or almost. It should be understood that young people learn from their mistakes, from overly ambitious projects for the duration of their stay or for the materials at their disposal. Thus the famous water heater worked ... in absolute terms. In reality, the oversized tank took too long to heat up. The project's success lies not in the water temperature, but in the solidarity and the awareness that students are able to achieve. Since humanitarian development is a long-term project, perhaps next year's students will take up the experience taking into consideration the difficulties encountered by this year's participants.

In the case of the wind turbine, the students knew it would work because this was confirmed by the prototype they built prior to departure. Perched on a hill, it now provides electricity for a lamp, which represents a lot given that the Ecuadorian



government has just imposed electricity cuts to conserve resources. For the students, seeing their wind turbine turning in the wind was a great source of pride and the explanations they provided enabled the Ecuadorians to understand how it works and how this will improve their quality of life over the medium term.

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CAS – The Teaching of English

As for the teaching of English, it is over a longer term that we will be able to assess its impact. What is the most interesting is how the Ecuadorian teachers observe the young Quebec students who teach. For many years, the two groups have been sharing their pedagogical knowledge but this year, the Ecuadorians taped the students at work, so that they could review their different methods in the teaching of vocabulary.

G4P – Epidemiological Study

The epidemiological study, for its part, revealed cultural differences between Ecuadorians and Quebecers, and this made it difficult to collect data. Ecuadorians do not suffer from diabetes and had never heard of cholesterol levels. Furthermore, their perception of health and sickness was not the same as that of the students: for indigenous Ecuadorians, medical tests and routine visits to the doctor were simply inconceivable; in their minds, they are associated with death rather than health and are perceived only as last resorts. Therefore it was with reticence that the Ecuadorians agreed to take the tests that the students proposed.

Lifelong Learning

As a teacher and as an adult, I always find it interesting to see students at work: how do they manage to get by in an unknown environment, one in which they necessarily have few reference points, where they come up against living conditions that are not easy, where the food could not be more repetitive and where good health is often lacking?

The discussions we had before leaving regarding the students' perceptions of the work to be carried out had to be revisited on site in order to avoid disappointments and to allow these experiences to rather become learning opportunities instead

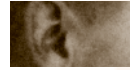
of obstacles. Since there are always unforeseen events, it was necessary to manage them without having students feel they had failed. The fact that a partner fails to appear on time for a meeting must not be considered a failure; a project that is not carried out as expected must be the topic of a discussion to see how this can be improved in the time remaining to be spent in Ecuador and how to avoid feeling frustrated for not having completed the project that they had at the time of departure from Montreal. These meetings are essential for the whole trip to run smoothly and they enable students – as well as those accompanying them – to learn unmistakable lessons from the experience.

This trip, often the first out of the country for the young people, sometimes heralds future vocations. Some students fall in love with South America or Ecuador; others acquire the taste for helping populations that live differently or for how much they learn thanks to their encounters with other cultures. On the other hand, still others experience this trip as an “ordeal” from which they will grow, certainly, but one that allows them to say that they do not wish to have other similar experiences ever again in their lives. This is because the shocks are big. Beyond the physical shock (we are at an altitude of more than 3,000 metres and oxygen is scarce), there is the cultural shock, the language barrier (Spanish is relatively common, but Quechua is the indigenous language) and the living conditions do not resemble at all those which young Quebecers know. This is without counting the know-it-all attitude of the North American even though such knowledge is not always useful in Ecuador...

Once these shocks have been overcome, the learning is unlimited, in spite of the fatigue and health issues of some participants. This too is where we see the qualities (and the faults) of our youth as the trip allows some to reveal themselves, both to the group and to themselves. Occasionally, some students who only have an average performance level in academic terms, suddenly stand out in the field; something that might suggest that our classes do not allow all to excel.

ON OUR RETURN

This trip would not take on its full meaning if the students did not engage in critical and structured reflection. In order to complete a trip report, it is necessary to take a step back: were the objectives stated at the outset totally achieved? Why? Are students satisfied with what they accomplished given the means at their disposal and who they are? Each year, this reflection on the trip enables students to engage in an introspection that goes way beyond their courses and what



they learn in the classroom. The comments they make also allow their teachers to re-examine a number of the certainties they had, whether they be disciplinary or pedagogical in nature. These comments formulated by the students on their return reveal to what extent this distancing is necessary in order to understand the benefits of such a trip. In 2008, for instance, Brigitte formulated an objective achieved and a problem she had not anticipated at departure time, taking into account her own cultural bias.

“I confirmed that I like teaching, even with the youngest children. But I realized that indigenous people have a very strong submission reflex. The shyness (expressed by the Ecuadorians toward the physical tests we had to make them take) made it difficult for the G4P to gather biological data.”

These trips also allow students to make anthropological observations, especially with regard to the relationships between majority and minority groups in Ecuadorian society. Laurence, for example, wrote that he had discovered a culture and a way of life fundamentally different from his own:

“While working with the children, I noticed their [differences] compared to children in Quebec societies. This enabled me to observe the importance of the enculturation process for human development.”

Moreover, it is this enculturation, this transmission of culture to the individual by society, that fascinates many students. Ecuadorians resemble us very little at first glance; they act in accordance with their own culture, without necessarily wanting to change or become like North Americans which our students are, even though they are always happy to see an IB group arrive in their village each year.

When they come back, students talk about Ecuador with enthusiasm and pride, even if things did not go exactly as they would have wished. They recognize their strengths and admit the weak points of their projects, some of them growing up enough to the point of admitting their own weaknesses. They have learned to refrain from judging others, whether it be their travelling companions or the Ecuadorians. And, it is somewhat of a cliché to say that this trip changed their lives; however, in spite of this cliché, it is the reality. Their knowledge of the developing world is no longer virtual, it is real, just like the knowledge they now have about themselves. All is not rosy, disagreements among participants are not uncommon, the generosity of some young people is more limited, the respect for others somewhat mitigated... But they all grow within the limits of who they are, although we may not always be able to measure that growth.

Even though all the G4P and CAS objectives seem to be met without difficulty every year, the fact of “reflecting on the ethical implications of their actions” always takes on a special meaning for them. Even if my colleagues and I prepare the students for the different shocks they will have on site, our words and examples are never as powerful or vivid as what they will see and experience: the North American sides of them are always a little outraged by the living conditions of the indigenous people of Ecuador. After this shock passes, they understand that their contribution to local communities is important, but that their view of the world will be more nuanced in future. They become aware of their roles in a world that includes injustices inherent to developed and developing countries; from then on, the students are citizens of the world and are no longer only citizens of their rich country.

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▶ LASTING CONNECTIONS

It is clear that our presence in Ecuadorian communities over ten years has a positive impact. Beyond the assistance that students bring to respond to needs expressed by communities, their contribution of funds is important for the village. The students pay their hosts for their stay, in fact, and this money serves to enrich the entire community. Thus, for the past ten years, I can say that the quality of life for the Ecuadorians in our host village has improved. They can now buy construction materials to improve their homes and common areas. They can also buy indigenous plants that the women cultivate and from which they can extract essential oils that they sell at the market. They eat better and they are beginning to see the importance of having a variety of plants in their fields and vegetable gardens. Furthermore, a long-term commitment is essential toward the communities that welcome IB students: international development makes sense only if we return to the same place year after year.

And in an effort to make yet another difference, in 2006 together with other colleagues and friends, I set up the Ecuador Fund which finances the studies of three Ecuadorian adults and three children every year. Although the adults have to leave their villages to follow university studies, the young people, for their part, stay where they are. In this way, we help community leaders to develop their competencies while also preparing for the next generation. The money provided by the Fund is an additional commitment to the host community



that welcomes us year after year. It is one more proof of our fondness for our partners in the south who surely benefit from our presence, but who also teach us so very much. 🍌

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